C. Acceptance

After applying the sheeting properly, test the adhesion to ensure it produces a durable bond equal to or greater than the strength of the reflective sheeting.

1. Ensure that the adhesion is strong enough to resist stripping from the blank when tested with a stiff putty knife.
2. Ensure that no air pockets or bubbles exist between the sheeting and the sign blank.

D. Materials Warranty

General Provisions 101 through 150.

910.2.03 Message

A. Requirements

Ensure that all finished signs have the following characteristics:

- The signs are clear-cut
- The lines of all letters and details true, regular, and free from all waviness, unevenness, and furry edges or lines
- The signs do not have scaling, cracking, pitting, blistering, dents, or blemishes of any kind
- The size, style, and spacing of the letters, numerals, symbols, and borders used to convey the message are according to the details shown in the MUTCD and on the Plans.

See Subsection 107.03, "Patented Devices," if patented materials are used.

B. Fabrication

Ensure that the legends and borders have one coat of silk screen paint as per Subsection 914.2.01.

1. Apply legends and borders by using one of the following processes:
   - Silk screening
   - Reverse screening
   - Directly applying nonreflective, durable, glossy plastic film that meets the requirements of Section 917.
2. Air-dry or oven-bake the sign at a temperature that will not affect the sign.
3. Demountable legends and borders may be used where approved by the Engineer.

NOTE: Attach all demountable legends (letters, numerals, symbols, and borders) to the sign face with pull-through rivets recommended by the manufacturer.

C. Acceptance

The Department will accept finished signs based on quality of workmanship and accuracy of dimensions and message.

D. Materials Warranty

General Provisions 101 through 150.

Section 911—Sign Posts

911.1 General Description

This section includes the requirements for the following:

- Galvanized steel sign posts
- Galvanized steel structural shape posts
- Aluminum structural shape posts
- Delineator posts
- Wood sign posts
- Ground-mounted breakaway sign supports

911.1.01 Related References

A. Standard Specifications

Section 106—Certification of Materials

Section 859—Guard Rail Components

Section 862—Wood Posts and Bracing

Section 863—Preservative Treatment of Timber Products

Section 913—Reflectorizing Materials

B. Referenced Documents

ASTM			
A 1	A709/A 709M	B 209 (B 209M)	B 766
A 123/A 123M	A 499	B 211 (B 211M)	G 53
A 153/A 153M	A 570 (A 570M)	B 221 (B 221M)	
A 193/A 193M	A 653/A 653M	B 308 (B 308M)	
A 307	A 715	B 695	

AASHTO M 181, Section 32

ANSI B 1.13M

ANSI B 18.22.1

AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (current edition)

Georgia Standard No. 9055

Southern Pine Inspection Bureau Grading Rules, 1977 Edition

NCHRP 350

QPL 29

QPL 35

QPL 69

911.2 Materials

911.2.01 Galvanized Steel Sign Posts (Drive Type)

A. Requirements

Use drive-type steel posts made of flanged "U" channel or square tubular sections. For a list of sources, see QPL 35.

1. U-Channel

   Use U-channel posts made of rerolled rail steel or new billet steel that meets the mechanical requirements of ASTM A 499, Grade 60, and the chemical requirements of ASTM A 1 for rails with nominal weights of 91 lbs/yd (45 kg/m) or greater.

   a. Dimensions, Weights, Tolerances: Use the dimensions, weights, and tolerances in Table 1 for U-channel posts, unless otherwise indicated on the Plans.

      1) Use post lengths as specified on the Plans.

      2) Use post assemblies within a sign structure from the same manufacturer.

Table 1—Dimensions, Weights, and Tolerances for Galvanized Steel Sign Posts (Drive Type)

Outside Diameters	TP 1 in (mm)	TP 2 in (mm)	TP 3 in (mm)	TP 4 in (mm)	Tolerance in (mm)
Flange Width					
a. Rib Back	2.063 (50)	3.125 (80)	3.5 (90)	3.75 (95)	± 0.125 (± 3)
b. Flat Back	2.313 (60)	3.125 (80)	3.5 (90)	3.75 (95)	± 0.125 (± 3)
Depth of "U"					
a. Rib Back	0.875 (22)	1.500 (40)	1.875 (50)	2.000 (50)	± 0.125 (± 3)
b. Flat Back	0.875 (22)	1.500 (40)	1.750 (45)	1.750 (45)	±0.125 (± 3)
Weight per linear foot (meter) before drilling, punching holes, or galvanizing)					
a. Rib Back	1.12 lb (1.7 kg)	2 lb (3 kg)	3 lb (4.5 kg)	4 lb (6 kg)	± 5%
b. Flat Back	1.12 lb (1.7 kg)	2 lb (3 kg)	3 lb (4.5 kg)	4 lb (6 kg)	± 5%

b. Bolt Holes: Ensure the bolt holes are properly punched or drilled with the following characteristics:

1) Holes are 3/8 in (10 mm) diameter and spaced 1 in, ±1/32 in (25 mm, ± 1 mm), center to center.

2) Ensure that the holes start 1 in (25 mm) from the top and extend the full length of the post for Types II, III, and IV, and at least 18 in (450 mm) for Type I.

3) The Department will not accept field-punched holes.

c. Coatings: Ensure that the posts are coated according to ASTM A 123/A 123M after the holes are punched or drilled.

2. Square Tubular

Use square tubular posts that meet the requirements of ASTM A 570 (A 570M), Grade 55 (380); ASTM A 715, Grade 60 (420); or ASTM A 653/A 653M, Grade 33 (230).

a. Dimensions, Weights, Tolerances: Use the dimensions, weights, and tolerances shown in Table 2 for square tubular posts unless otherwise indicated on the Plans:

Table 2—Dimensions, Weights, and Tolerances for Square Tubular Posts

	TP 5	TP 6	TP 7	TP 8	Tolerance
Outside size, in (mm)	1.000 (25)	1.7 50 0(45)	2.000 (50)	2.500 (63)	± 0.010 (0.3)
Wall thickness, in (mm)	0.0 65 (1.7)	0.083 (2.1)	0.083 (2.1)	0.105 (2.7)	± 0.010 (0.2)
Weight before drilling/ punching holes or galvanizing, lb/ft (kg/m)	0.83 (1.2)	1.8 (2.7)	2.1 (3.1)	3.4 (5.1)	± 5%

1) Use post lengths as specified on the Plans.

2) Use post assemblies within a sign structure from the same manufacturer.

b. Bolt Holes: Ensure all bolt holes are properly punched or drilled with the following characteristics:

1) Holes are 7/16 in, ± 1/64 in (11 mm, ± 0.5 mm) diameter and spaced 1 in, ± 3/64 in (25 mm, ± 1 mm) center to center.

2) Ensure that the holes start 1 in (25 mm) from the top and extend the full length of the post on all four sides for Types 6, 7, and 8, and at least 18 in (450 mm) on all four sides for Type 5.

3) The Department will not accept field-punched holes.

c. Coatings: Coat square tubular posts with zinc at a minimum thickness of 0.90 oz/ft^2 (275 g/m^2).

3. Bolts, Nuts, and Washers

   Use bolts, nuts, metallic washers, and spacers made of aluminum, stainless steel, or galvanized steel. Use stainless steel that meets the requirements of ASTM A 193/A 193M, Type B8.

   a. Bolts: Use bolts 5/16 in (8 mm) diameter with hexagonal heads. Ensure they are long enough to extend at least 0.25 in (6 mm) beyond the nut when installed.
      1) Use a bolt thread fit of ANSI B 1.13M, Class 6H.
      2) If using aluminum bolts, ensure that the aluminum meets the requirements of ASTM B 211 (B 211M), Alloy 2024-T4.
   b. Nuts: Use self-locking, plastic-insert hex nuts.
      1) Use a bolt thread fit of ASNI B 1.13, Class 6G.
      2) If using aluminum bolts, ensure that the aluminum meets the requirements of ASTM B 211(B 211M), Alloy 2017-T4.
   c. Washers: Place metallic washers under all bolt heads. Place nylon washers between the metallic washer and the sign face.
      1) If using aluminum washers, ensure that the aluminum meets the requirements of ASTM B 209 (B209M), Alloy 2024-T4.
      2) Use aluminum washers with 25/64 in (10 mm) inside diameter, 0.75 in (19 mm) outside diameter, and 0.091 in (2.3 mm) thick.
      3) Use standard galvanized and stainless steel washers that meet the size requirements of ANSI B 18.22.1.
      4) Use nylon washers with 13/32 in (10 mm) inside diameter, 13/16 in (21 mm) outside diameter, and 1/16 in (1.6 mm) thick. Use nylon washers in combination with metallic washers to prevent torsional damage caused by the twisting action of the bolt heads.
   d. Coatings: Use galvanized steel bolts and nuts that meet ASTM A 307 requirements.

B. Fabrication

1. Roll or form post sections of the dimensions specified.
2. Round all sharp corners and make rough or burred parts smooth.
3. Punch or drill holes as specified in Subsection 911.2.01.A.1.b.
4. Galvanize as necessary, according to ASTM A 153/A 153M.

C. Acceptance

Get approval for each sign support matrix from the FHWA.

The FHWA evaluates the matrix according to the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, current edition.

D. Materials Warranty

General Provisions 101 through 150.

911.2.02 Galvanized Steel Structural Shape Posts

A. Requirements

1. Ensure that the galvanized steel shapes for sign posts match the shape and dimensions shown on the Plans.
   a. Use steel that meets the requirements of ASTM A 709 (A 709M) Grade 36 (245).
   b. Galvanize the shapes according to ASTM A 123/A 123M. Handle the structural shape through only one hole during galvanizing.
2. Submit a certification according to Subsection 106.05, “Materials Certification.”

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

911.2.03 Aluminum Structural Shape Posts

A. Requirements

1. Ensure that the aluminum shapes for sign posts match the shape and dimensions shown on the Plans.

NOTE: Use aluminum that meets the requirements of ASTM B 308/B 308M, Alloy 6061-T6.

2. Submit a certification according to Subsection 106.05, "Materials Certification."

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

911.2.04 Delineator Posts

A. Requirements

1. Check the Plans for the types of delineator posts to use. For a list of sources, see QPL 69.
2. If using flexible delineator posts, use only those indicated on the Georgia Department of Transportation Qualified Products List.
3. Mounting

   Fasten all delineators to be mounted on galvanized or aluminum posts with commercial aluminum lock bolts.

NOTE: Fasten delineators to be mounted on wood posts with galvanized wood screws.

4. Galvanized Steel Posts

   Use posts that meet the requirements of Subsection 911.2.02.A.
5. Aluminum Flange Type Posts

   Use aluminum that meets the requirements of ASTM B 221 (B 221M), Alloy 6063-T6.
   a. Provide a post section in the form of a flanged "U" with dimensions shown on the Plans. Point the bottom of the post.
   b. Punch or drill holes as specified in Subsection 911.2.01.A.1.b.
6. Wood Delineator Posts

   Use 4 in (100 mm) square posts of the length specified on the Plans.
   a. Use wood posts that meet the requirements of Subsection 862.2.02.
   b. Treat wood posts with preservative according to Section 863.
7. Flexible Delineator Posts

   Use posts made of a durable plastic or poly resin material. Check the Plans to see the type of flexible delineator post used for each location.
   a. Physical Characteristics: Use posts that can either be driven into the ground with equipment that does not damage the posts or reflective sheeting, or be surface-mounted onto pavement.
      1) Drill or form pilot holes where necessary to embed the posts as shown on the Plans.
      2) Classify flexible delineator posts as follows:

Type I	Curved or flat
A	Soil mount
B	Surface mount
Type II	Tubular
A	Soil mount
B	Surface mount

3) Use durable, flexible, non-discoloring posts that can recover from repeated vehicle impacts.
4) Ensure that materials used to manufacture flexible delineator posts are stabilized with UV (ultraviolet) inhibitors to prevent degradation.
5) Ensure that the posts are inert to normal atmospheric elements and chemicals possibly used in grass or weed control.
6) Use material for the post that can accept reflective sheeting.

b. Color: Use gray, white, or yellow posts, as required.
c. Reflective Sheeting: Use white or yellow reflective sheeting on the posts as required.
1) Use sheeting that meets the requirements of Subsection 913.2.01, Type III.
2) Obtain approved reflective sheetings from QPL 29.
d. Certification: Submit a certification from the manufacturer that the flexible delineator posts are formulated of the same material as when tested by National Transportation Product Evaluation Program (NTPEP) and will meet the requirements of this Specification.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. Performance Criteria

Get approval for flexible delineator posts through the evaluation performed by NTPEP or the Southeastern Association of State Highway and Transportation Officials (SASHTO) Regional Test Facility.

The Department will use the data generated by the NTPEP and SASHTO testing to select usable materials that performed satisfactorily when tested with the following material and field tests.

2. Shapes and Dimensions (Materials Test)
a. Ensure that flexible delineator posts are curved, flat, or tubular with the upper 14 in (350 mm) presenting at least a 3 in (75 mm) wide profile facing approaching traffic.
b. Place the top of the wide profile sheeting 0.5 in (13 mm) from the top of the delineator post.
c. Cap the top of tubular posts to prevent water inclusion.
d. Design flexible delineator posts that are soil mounted to connect with a drive-type anchor base made of corrosion-resistant material. When a post is no longer serviceable, remove it and replace it in the same anchor base.
e. Ensure that the minimum length for the anchor base is 18 in (450 mm) and the minimum height above ground for the soil mount flexible delineator posts is 48 in (1200 mm).
f. Design surface-mount flexible delineator posts to connect with the base assembly and be easily replaced when the existing post is no longer serviceable. Use post heights of 24 in (600 mm), 36 in (900 mm), or 48 in (1200 mm), as required.
3. Weathering (Materials Test)
a. Ensure that flexible delineator posts withstand 1,000 hours of UV exposure in the QUV weatherometer without significant color change or physical deterioration. If the Department sees splitting, cracking, delaminating, or other failures, it will reject the delineator post.
b. The Department will conduct the test according to ASTM G 53.
4. Field Tests

Perform impact tests on the flexible delineator posts as described below:

a. Install 8 delineator posts in 2 rows of 4 each so that 1 row will be bumper hits and 1 row will be wheel hits in 1 pass of the vehicle.
b. Set the delineator post with a height of 48 in, ± 1 in (1200 mm, ± 25 mm) from ground level with the reflective sheeting facing the test vehicle.
c. Use a standard American sedan or pickup for the test vehicle. Ensure that the vehicle has no unusually sharp hood ornaments or other appurtenances.
d. Impact 8 delineator posts 10 times with the test vehicle at 55 mph (90 kph)
e. Hit the posts five times at an ambient temperature of 32 °F, ± 5 °F (0 °C, ± 2 °C) and five times at an ambient temperature of 85 °F, ± 5 °F (30 °C, ± 2 °C).

f. After concluding the impact test, ensure that at least 5 of the 8 posts remain intact, are securely anchored, and return to their original vertical orientation within an angle of ±10 degrees.

g. Of the 5 posts that remain intact, ensure that they also retain at least 50 percent of their reflective sheeting and show minimal signs of distress (cracking, loss of rigidity).

5. The Department will place flexible delineator posts that pass the laboratory material test and field test requirements on the approved list.

D. Materials Warranty

General Provisions 101 through 150.

911.2.05 Wood Sign Posts

A. Requirements

1. Use wood sign posts to support special signs, when noted on the Plans. Use posts that comply with Georgia Standard No. 9055.
2. Treat the posts with preservative according to Section 863 and Standard No. 9055 notes.
3. Use wood that matches that specified in Subsection 859.2.04, except that it shall meet the grading requirements for No. 1 SR or No. 2 SR as specified in the current Southern Pine Inspection Bureau Rules.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

General Provisions 101 through 150.

911.2.06 Ground Mounted Breakaway Sign Supports

A. Requirements

1. Use ground-mounted breakaway sign supports of any assembly approved by the Department as a breakaway foundation. For a list of sources, see QPL 63.
2. Design the support to modified AASHTO wind loads of 70 mph (112 kph).
3. Certification

   Furnish a copy from the manufacturer of an independent testing agency report showing that the support has been dynamically tested according to AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals, current edition.

   a. Furnish evidence that the support has been tested and has met the criteria established in NCHRP 350.

   b. Supply a certification showing the physical properties of the material and how it meets the Specifications, as stated in Subsection 106.05, “Materials Certification.”

   c. Show evidence that the assembly has been used successfully in installations with similar environmental and Project conditions to the satisfaction of the Department.

4. Sign Support Design

   a. Type A: A single-post mount that can support a 7 ft² (0.65 m²) sign mounted to the centroid 9 ft (2.7 m) above ground.

   b. Type B: A two-post mount that can support a 18 ft² (1.67 m²) sign mounted to the centroid 9 ft (2.7 m) above ground.

   c. Type C: A three-post mount that can support a 37 ft² (3.4 m²) sign mounted to the centroid 9 ft (2.7 m) above ground.

5. Base Assembly

   a. Ensure that the furnished base assembly protrudes no more than 4 in (100 mm) above ground.

   b. Ensure that the foundation assembly is compatible with the applicable sign post in Subsection 911.2.01.

   c. Ensure that the assembly is galvanized with the hot-dip method as per ASTM A 123/A 123M or an approved equal.

d. To use an alternate protective coating, obtain approval from the Office of Materials and Research before using it on Department Projects.

6. Assembly Hardware
   a. Use base attachment hardware that matches the Plans and is as recommended by the manufacturer.
   b. Ensure that the hardware is protectively coated as in ASTM A 153/A 153M, ASTM B 695 Class 55, or ASTM B 766 Type II, class 12-, whichever is applicable.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Use foundation assemblies that are FHWA-approved for the specific design category for which the unit was evaluated.

Foundation assemblies are evaluated according to AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals, current edition.

D. Materials Warranty

General Provisions 101 through 150.

Section 912—Sign Blanks and Panels

912.1 General Description

This section includes the requirements for aluminum sign blanks and panels, and extruded aluminum sign panels.

912.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

ASTM B 108

ASTM B 209 (B 209M)

ASTM B 221 (B 221M)

ASTM F 467 (F 467M)

ASTM F 468 (F 468M)

ASTM B 211 (B 211M)

912.2 Materials

912.2.01 Aluminum Sign Blanks

A. Requirements

1. Use aluminum sign blanks of the type, size, and shape specified:
   a. Type I: Signs with an area of 9 ft² (0.84 m²) or less, at least 0.08 in, ± 0.005 in (2 mm, ± 0.125 mm) thick.
   b. Type II: Signs with an area more than 9 ft² (0.84 m²), at least 0.10 in, ± 0.006 in (2.5 mm, ± 0.150 mm) thick.
2. Use metal for the sign blanks that meets the requirements of ASTM B 209 (B 209M), Alloy 6061-T-6 or 5052-H38.
3. See Table 1 for locations of bolt holes in the sign blanks. Punch or drill bolt holes 10 mm diameter. The table shows where the holes are located for each type and size of blank.
4. Submit to the Engineer at least 1 ft² (0.1 m²) of the sign material for each lot or shipment of each type.